

PATENT SPECIFICATION

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(54) METHOD OF TREATING A WOODEN ARTICLE WITH A FUNGICIDE

(71) We, IMPERIAL GROUP LIMITED, a British Company, of Imperial House, 1 Grosvenor Place, London SW1X 7HB, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement—

This invention relates to a method of treating a wooden article with a fungicide.

Wooden pallets are often used to transport packs of cigarettes or packaged foods. A timber fungicide is required to prevent, or at least retard, mould growth on the pallets which may taint cigarettes or food placed on or adjacent the pallets.

Many timber fungicides are known but cannot be used in the cigarette and food industries because they are toxic. Pentachlorophenol for example is a well known timber fungicide, but some species of moulds can convert it to penta- and tetra-chloroanisoles which have persistent musty odours capable of tainting cigarettes or food.

The present invention provides a simple method of treating wooden articles with a selected fungicide to prevent or retard mould growth, which fungicide does not itself poison or taint packaged cigarettes or food placed on the treated articles or near them. Examples of such articles are pieces of cut timber, pallets, shelves and tables.

According to the invention, a method of treating a wooden article with a fungicide comprises applying to the whole surface of the article for at least one minute a preparation of copper - 8 - hydroxyquinolate mixed with water whose copper constituent is in particulate form having a particulate size less than one micron.

No heat treatment is required and the water may be cold water.

Experiment 1.

Wooden pallets may have elm wood for their corner blocks. Since dry elm wood was

becoming scarce for pallets the following tests were carried out on wet elm.

CUNILATE 2419 is a known fungicidal preparation having copper - 8 - hydroxyquinolate as its active ingredient. CUNILATE (Registered Trade Mark) is a registered trade mark of Cuprinol Limited, of Frome, Somerset. This preparation is used on paper, paper-mache, fibre-board and plasterboard but to our knowledge its use on wood has never been suggested.

It has the following properties:

Copper-8-hydroxyquinolate: 10% by volume

Copper: 1.8% minimum by volume
 Copper constituent particle size: Less than one micron

Specific Gravity: 1.0 (15°C)

Solids content: 50% by volume

Fluidity-room temp.: Just pourable.

The CUNILATE 2419 preparation is diluted by adding clean cold water slowly to the preparation whilst stirring continuously.

Elm corner blocks were cut into pieces $2 \times 1\frac{1}{2} \times 1\frac{1}{2}$ " and soaked in water for 24 hours. This soaking resulted in a moisture content in the blocks of around 45%. Extended soaking (5 days) of blocks in the laboratory resulted in maximum moisture levels in the elm of around 47%, so the value obtained from overnight soaking was felt to be realistic.

Six wet blocks were immediately taken and treated by immersion in each of 5 CUNILATE 2419 solutions (10, 20, 20, 40 or 50% v/v) for 3 mins. Six wet blocks were also immersed in water for 3 mins. to serve as controls. Half the number of blocks at each preservative concentration were left at room temperature for 24 hours, the remaining half being left at room temperature until they were completely dry (5 days). Immediately after the appropriate drying stage, all blocks were leached in continuously running water for 24 hours to check whether in practice exposure to water (e.g. rain) would

affect the treatment. Leached blocks were then placed on the surface of DIFCO (Registered Trade Mark) Mildew Test Agar in a 250 ml beaker, and each was inoculated with mixed spore suspension (1 ml) containing spores of selected moulds viz. *Aspergillus glaucus* spp., *Penicillium chrysogenum*, *Trichoderma viride*, *Trichothecium roseum* and *Stemphylium lanuginosum*. The beakers were sealed with Parafilm sealing tissue, and incubation was carried out at 27°C. The blocks were inspected

after 28 days and the number mouldy was recorded. At the end of this 28 day incubation period, non-mouldy samples were re-inoculated with spore suspension (1 ml) prepared in the same way as that used previously and incubated for a further 14 days. This was to check that the failure of these samples to develop mould was not due to the absence of viable spores.

The results obtained in this experiment are presented below:—

Cunilate 2419 Concn. (%, v/v)	Blocks Mouldy (%)			
	After 28 days		After 42 days (Reinoculated)	
	24 hr. Dried	5 Day Dried	24 hr. Dried	5 Day Dried
10	33	33	33	33
20	33	67	33	67
30	0	0	0	0
40	0	0	0	0
50	0	0	0	0
Control	100.0	100.0	100.0	100.0

The above Table indicates that for a single immersion the concentration of the water-based CUNILATE 2419 should be from 30% to 50%. The efficiency of the treatment did not change with the difference in drying times and the fungicide adhered tenaciously to the wood but the wood should not be used before the fungicide has dried. Instead of immersion, the fungicide may be sprayed on to the whole surface of the elm wood.

Example 1.

The following preservation treatment was carried out on wet elm corner blocks and dry Swedish Softwood components, all designed for assembly into a wooden pallet.

The hard or close-grained wet elm blocks were immersed in a bath for at least 3 minutes in a cold-water-based CUNILATE 2419 fungicide having a concentration of 20% volume. They were then removed from the bath, allowed to dry out, and assembled with the untreated wide-grain Swedish Softwood components to form the pallet. The latter was then immersed for at least 3 minutes in a cold-water-based CUNILATE 2419 fungicide having a concentration of only 10% by volume. In this manner the close-grained wet elm blocks received a double treatment providing effectively a concentration of 30% by volume of fungicide whereas the wide-grained Swedish Softwood components received a single treatment at a lesser concentration.

After drying out, the pallet was ready for use.

Experiment II.

The following preservative treatment was carried out on two types of pallet wood, Maritime Pine (a softwood) and Elm (a hardwood used as end blocks in pallets). The wood was cut into small blocks, approximately $1\frac{1}{2}'' \times 1\frac{1}{2}'' \times \frac{1}{4}''$ for testing. All blocks were leached in continually running water for 24 hours following treatment, as a check on exposure to water.

In this Experiment the fungicide preparation was CUPRINOL DISPERSION AQ which is also marketed by Cuprinol Limited for use on paper and fibreboard. Cuprinol is a Registered Trade Mark. To our knowledge its use on wood has never been suggested. It has the following properties.

Active Agent

Copper-8-hydroxyquinolate: 32% by volume

Copper: 5.9% by volume

Copper constituent particle size: Less than one micron

Specific Gravity: 1.0 (15.5°C)

Solids content: 33.8% by volume

The preparation is diluted by adding clean cold water slowly to the preparation, whilst stirring continuously.

Wood blocks were coded on one surface with a ballpoint pen, and then immersed in

the fungicide aqueous solution for 3 minutes. After this treatment, the blocks were either air-dried for 24 hours, or subjected immediately to leaching in continually running water for 24 hours. Air dried blocks were also leached for 24 hours after their drying period. Control blocks, which received no preservative treatment, were also set up. After leaching, blocks were placed onto the surface of Difco Mildew Test Agar in a 9 cm petri dish (1 block/dish), and inoculated with a spore suspension (1 ml) containing spores of

Aspergillus glaucus, *Penicillium chrysogenum*, *Gladosporium butyri*, *Chaetomium globosum*, *Trichothecium roseum* and *Trichoderma viride*.

After inoculation, the petri dish lids were replaced, and the dishes were incubated at 28°C and 85% Relative Humidity. Blocks were examined after 28 days, and the numbers of mouldy blocks recorded. Table 2 contains the results for Maritime Pine, and Table 3 the results for Elm.

TABLE 2

Maritime Pine

Fungicide	Concn. (% v/v)	Blocks Mouldy (%)	
		Air-dried	No-drying
Dispersion AQ	2	6.25	18.75
	5	6.25	0
	10	0	0
	20	0	0
Controls	—	62.50	66.67

TABLE 3

Elm

Fungicide	Concn. (% v/v)	Blocks Mouldy (%)	
		Air-dried	No-drying
Dispersion AQ	2	25.00	43.75
	5	31.25	50.00
	10	18.75	43.75
	20	0	31.25
Controls	—	100.00	100.00

Table 2 shows that the preferred treatment for Maritime Pine is immersion for at least one minute in a 10–20% concentration, subsequent air drying being optional.

Table 3 shows that the scope for effective treatment of dry elm is limited, the only effective treatment being immersion for at least one minute in a 20% concentration followed by air drying.

Compared with CUNILATE 2419, the use of DISPERSION AQ which has a greater copper content is more costly.

Whichever fungicide having copper - 8 - hydroxyquinolate as its active agent is used,

the water base avoids taint problems and fire risks associated with spirit-based preparations. The low particle size of the copper constituent in the active agent facilitates penetration of the wood which is particularly important for hardwoods such as elm. As a result adhesion of the fungicide to the wood is improved.

If required a small portion of a suitable dye may be incorporated in the fungicide to facilitate visual recognition of treated articles such as pallets. For example, in the case of pallets or shelves for tobacco goods or for food a suitable water-soluble dye compatible with the active agent is ORANGE GS.

WHAT WE CLAIM IS:—

1. A method of treating a wooden article with a fungicide comprising applying to the whole surface of the article for at least one minute a preparation of copper - 8 - hydroxyquinolate mixed with water whose copper constituent is in particulate form having a particulate size less than one micron.
2. A method according to Claim 1, wherein the article is immersed in the fungicidal preparation in aqueous solution for at least three minutes.
3. A method according to Claim 1 or 2 wherein the article is of an elm wood or a Swedish Soft wood and the fungicidal preparation has substantially the following properties:
 - Copper-8-hydroxyquinolate: 10% by volume
 - Copper: 1.8% minimum by volume
 - Solids content: 50% by volume
 - Specific gravity: 1.0 (at 15°C)
 - Fluidity—room temperature: Just pourable.
4. A method according to claim 3, the article being of an elm wood, wherein the fungicidal preparation has a concentration in aqueous solution of from 30% to 50%.
5. A method according to claim 3, the article being of an elm wood, wherein the fungicidal preparation is applied to the article in aqueous solution in two separate stages, the concentration of the solution being substantially 20% by volume in one stage and substantially 10% by volume in the other stage.
6. A method according to claim 1 or 2 wherein the article is of a Swedish Soft Wood and the fungicidal preparation has a concentration in aqueous solution of substantially 10% by volume.
7. A method according to claim 1 or 2, wherein the article is of a Maritime Pine wood and the fungicidal preparation has substantially the following properties:
 - Copper-8-hydroxyquinolate: 32% by volume
 - Copper: 5.9% by volume
 - Solids content: 33.8% by volume
 - Specific gravity: 1.0 (at 15.5°C)
8. A method according to claim 7, the article being of Maritime Pine Wood, wherein the fungicidal preparation has a concentration in aqueous solution of from 10% to 20%.
9. A method according to claim 1 or 2 wherein the article is of an elm wood and the fungicidal preparation has a concentration in aqueous solution of 20% by volume and has substantially the following properties:
 - Copper-8-hydroxyquinolate: 32% by volume
 - Copper: 5.9% by volume
 - Solids Content: 33.8% by volume
 - Specific gravity: 1.0 (at 15.5°C).
10. A method according to claim 1 or 2, wherein the fungicidal preparation/aqueous solution incorporates a dye to facilitate visual recognition of the treated article.
11. A wooden article treated according to any of the preceding claims.

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